

# **The Personal SoundComm System**

## **AD20msp8xx Series of Chipsets**

### **INTRODUCTION**

In early 1992, Analog Devices embarked on its Signal Computing initiative, a business and technology model that marries DSP technology, analog I/O technology, signal processing algorithm software, and system integration to provide the latest popular signal processing functions as complete products for system-level OEMs. In this manner, manufacturers with no expertise with DSPs or signal processing functions could go to market quickly with popular DSP-based products like fax/data modems and audio cards.

The AD20msp800 series of chipsets has evolved from other product lines focused on audio and fax/data modem chipsets. This series takes the base technology embodied in these other families and enhances it with other signal processing functions.

#### **Personal SoundComm™ System**

The AD20msp800 series of chipsets provided by Analog Devices are the core ICs of a complete hardware and software solution. The reference designs that use these chipsets have been named Personal SoundComm Systems (PSCSs) and have been made generally available to developers and manufacturers as the PSCS I, PSCS II, and PSCS IIa.

Personal SoundComm Systems developed to date are hardware and software variations of a core design that utilizes the AD20msp815 chipset. This chipset includes the ADSP-2101 DSP, the AD1848 audio signal port, the AD28msp01 modem signal port and two custom ASICs that fulfill many audio and telephony requirements. The remaining components required in a PSCS design depend on its functionality but would include such components as SRAM, DAA circuitry to the phone line, audio I/O connections to speakers, MIDI port, handset support, resistors, and capacitors. A complete bill of materials for the PSCS IIa is attached.

### **SYSTEM FUNCTIONALITY**

The AD20msp815 chipset is the signal computing engine that enables many popular functions on the PSCS.

#### **FAX/Data Modem**

The PSCS is a complete 14.4 Kbps fax and data modem. The ADSP-2101 runs all modem software including not only traditional data pump code but data compression, error correction and AT command decoding traditionally found in a microcontroller. This is the SoftModem™ technology developed by Digicom systems and was the first high-speed modem design on the market to use only one processor.

## **Audio**

The PSCS is a complete 16-bit audio industry standard sound card compatible that uses the same DSP chip for the audio subsystem engine. This functionality of the PSCS is based on the Personal Sound System (PSS) developed by Echo Speech Corporation and Euphonics. The PSS was one of the first DSP-based general purpose audio and games compatible cards on the market.

The Echo and Euphonics algorithms run concurrently and perform the following functions: The Echo software receives and interprets audio commands sent by the PC application. These are either digitized audio commands with PCM or ADPCM samples, or music synthesis commands. PCM or decompressed ADPCM samples are sent directly to an audio DAC to create the desired sound. Music synthesis commands are passed to the Eusynth-1 or Eusynth-2 algorithm that synthesizes the desired sound, Eusynth-1 for 11-voice synthesis, Eusynth-2 for Wavetable synthesis.

## **Enhanced Telephony**

The PSCS IIa supports many other telephony related functions in addition to fax/data modem. Using application software such as Ring Central from Ring Zero with the PSCS adds answering machine, speaker phone, conversation recording, message forwarding, telephone control, and more. Handset support was added with a small amount of additional circuitry but added several new functions to the base design. This is an excellent example of a key goal of signal computing which is to create hardware platforms that are very software-expandable with only minor hardware modifications.

## **Chipset Components**

The ADSP-2101 is a single-chip microcomputer optimized for high-speed numeric processing required for signal processing. The core processor is comprised of three computational units, data address generators, and a program sequencer. It has two serial ports, a programmable timer, extensive interrupt capabilities and on-chip program and data memory RAM. The ADSP-2101 is supported by a complete set of tools for software and hardware system development. It is completely code compatible with other members of the ADSP-2100 family. Therefore code written for one processor in the family can be simply moved over to another. The Personal Sound System chipset referred to above uses the ADSP-2115 and its algorithm software was moved to the AD20msp815 chipset without any code rewrite.

The AD1848 SoundPort® stereo codec integrates the key audio data conversion and control functions into a single integrated circuit. It requires only +5V power and external circuit requirements are limited to a minimal number of low cost components. Dynamic range exceeds 80 dB over the 20 KHz audio range and the device supports all popular sample rates in the range from 5.5 KHz to 48 KHz.

The AD28msp01 is a complete analog front-end for high performance DSP-based modems. The device includes all data conversion, filtering and clock generation circuitry needed to implement an echo-canceling modem with a single digital signal processor. Programmable sample rates and clocking modes support all established modem standards through V.32bis and like the AD1848, the AD28msp01 requires only +5V power.

The two other custom ASICs in the chipset complete the audio and telephony solution. They provide the ISA bus interface, register emulation, and miscellaneous control logic to minimize IC count and cost on the board. The remaining PSCS components required outside the chipset are few and commonly available devices like SRAM, resistors, and capacitors.

## **PRICING**

The AD20msp815A includes the following:

ADSP-2101KP66

AD1848KP

AD28msp01KR

ESC-614

DSI-517

Licenses for the following DSP algorithms:

11 voice music synthesis

14.4 data and fax modem

answering machine

speakerphone

DSP manager

## Personal SoundComm System Ila

Cost Estimate

Total Cost @  
100k

Analog Devices Chipset	50.50
AD20msp815A	
ADSP-2101KP-66, AD28msp01KR, AD1848KP	
DSI517, ESC614, Eusynth1 and Soundblaster	
Command and Control Software, Modem	
Algorithm and telephony software	
Memory (3 32K X 8)	6.90
Crystals	2.18
Discrete Components	17.03
Capacitors & Resistors	3.17
Board, Bracket	4.25
<b>Total B.O.M. Cost</b>	<b>84.03</b>

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# Personal SoundComm System Ila

## Bill of Materials

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Item	Qty	Description	Part #
<b>AD20msp815 Chipset</b>			
1	1	Modem ASIC	DSI-517
2	1	Audio ASIC	ESC-614
3	1	DSP, 68-lead PLCC	ADSP-2101KP-66
4	1	Telephony Signalport, 28-lead SOIC	AD20msp01KR
5	1	Stereo Audio Soundport, 44-pin PLCC	AD-1848KP
<b>Memory</b>			
6	3	32k x 8 Static RAM -20ns	
<b>Crystals</b>			
7	1	24.576 MHz Crystal, low profile	
8	1	16.9344 MHz Crystal, low profile	
9	1	16.0 MHz Crystal, low profile	
10	1	13.824 MHz Crystal, low profile	
<b>Discrete Components</b>			
11	1	IC	24C04
12	1	IC	74ACTQ373
13	1	IC, Hex Inverter, SMD	74HC04
14	1	IC	74HCT273
15	1	IC, Dual D-type Inverter, SMD	74HCT74
16	2	IC, Octal transceiver, SMD	74LS245
17	1	IC, Octal transceiver, SMD	74LS245
18	2	IC	7805
19	1	IC	79L05
20	1	IC	AIC-6360
21	1	IC	AN7149N
22	3	IC	GAL20V8, 25ns
23	1	IC	H11A1
24	1	IC	H11A1
25	3	IC	LF353
26	1	IC	LF353
27	1	IC, SMD	NE558
28	1	IC	QS3383
29	1	IC	TDA8425
30	1	IC	UPD1406
31	1	IC	UPD6376
32	1	Transistor	2N6427
33	1	Transistor	2N3906
34	2	Transistor	2N3906
35	2	Transistor	2N3904

# Personal SoundComm System IIa

## Bill of Materials

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36	4	Transistor	N-CH FET
37	1	Diode Zener, 33V	
38	2	Diode Zener, 24V	
39	1	Diode Zener, 8.2V	
40	2	Diode Zener, 3.9V	
41	4	Diode	1N4002
42	11	Diode	1N914
43	1	Transformer	
44	1	Fuse, 1A	
45	2	Relay	
46	8	Ferrite bead	
47	1	Ferrite inductor	
48	1	RJ11 Dual Phone jack	
49	1	4-pin Header / connector, Internal speaker	
50	1	4-pin Header / connector, CD-ROM	
51	3	4-pin Connector, Audio jack	
52	1	50-pin Header / connector	
53	1	40-pin Header / connector	
54	1	34-pin Header / connector	
55	1	16-pin Header / connector	
56	1	14-pin Header / connector	
57	1	32-pin Connector, DIP socket	
58	1	8-pin Connector, mini-DIN	
59	1	3x2 Header / connector	
60	2	Connector, shunt	
<b>Capacitors</b>			
61	3	1000 microf Capacitor, 16V	
62	1	.47 microf Capacitor, polymer, 250V, 10%, TH	
63	5	Capacitor, electrolytic	
64	19	Capacitor, electrolytic	
65	1	Capacitor, electrolytic	
66	1	Capacitor, non-polar, electrolytic	
67	69	Capacitor, ceramic, 10%	
68	8	Capacitor, ceramic, 10%	
69	41	Capacitor, ceramic, 10%	
<b>Resistors</b>			
70	3	Resistor network, 220/330 x 8	
71	68	Resistor, 5%, 1/10W	
72	59	Resistor, 5%, 1/10W	
73	1	Resistor, MOV	
<b>Resistors</b>			
74	1	Bracket	
75	3	Screws / fasteners	
76	1	PCB, 4 layer, 12.35" x 4.175", 8mil	